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# BROWN ROT OF SOLANACEOUS PLANTS

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Brown rot (*Bacterium solanacearum* E.F.S.) of solanaceous plants is known to occur year after year on the same local areas in the same or closely related kinds of plants. There may be considerable variation in the severity of the disease on the same land from year to year, especially with certain crops. This parasitic bacterium survives from season to season in certain cultivated soils of Florida.

The parasite is widely distributed in Florida and causes severe losses in the central, northern and western sections of the state, and elsewhere on sand and sandy loam soils. It is not freqently found on muck, peat or marl soils. Low, moist locations in specific fields appear to be more suitable for the survival of the causal organism than high, dry land.

The disease is known to occur more frequently on soil with a reaction ranging from pH 5 to 7. The bacterium rarely causes trouble in soils below pH 4.5 and is killed at pH 4 and below.

Of the widely grown plants, the tomato, potato, eggplant, pepper and tobacco are most commonly affected by brown rot. Certain ornamental annuals of the nightshade family, such as datura and petunia, also are affected. The disease attacks representatives of at least two score additional families of plants. In commercial plantings of potatoes in Florida this parasite in a single season has caused as much as $117,000 loss and been of more importance economically than all other potato diseases combined. Entire pepper plantings have been destroyed when rotated with potatoes that were severely affected. This disease usually can be found in varying degrees

of severity in most tomato and eggplant fields in central Florida. In certain 10-acre fields of eggplants from 50 to 60 percent of the plants have been killed. It has been destructive in fields planted for the first time and observed to diminish in severity during succeeding seasons.

The causal organism may be disseminated to distant sections in potato tubers used as seed and in various solanaceous seedlings grown in infested soil that are used as transplanting stock. However, contaminated potato tubers are not a frequent means of distribution, primarily because the disease is not common in the seed-producing areas. Local distribution on a farm or within a certain field will depend largely on the pH of the soil. If within the proper range all that is required for the disease to become established in a new locality is the movement of infested soil from an area growing diseased plants. This is usually done by wind-blown or water-carried soil particles. Cultivation by plow, harrow or cultivator through a small contaminated area may carry soil particles harboring the parasite the full length of the field in all directions from a definite location. Soil adhering to roots of seedlings also may carry the parasite. Transfer of infected seedlings offers means of local spread of the disease. Infection usually takes place through the root system. The parasite is known to live for many years in certain cultivated soils.

## SYMPTOMS

Since symptoms of brown rot on tomato, eggplant and pepper differ from those on potato and on tobacco, the principal characters on these three groups will be pointed out separately.

On eggplant, pepper and tomato, brown rot is first detected in the field by the flabby appearance of affected plants during the hottest part of the day. Such plants, which recover at night, usually show a slightly darker green color of the foliage and stems. The period of wilt during the day gradually becomes longer and the symptoms at first confined to the young growing tips gradually involve more and more of the aerial parts of the plants. During periods of low humidity, lack of rain and high temperatures the disease develops rapidly. After several days the wilted plants may fail to recover during the night and that marks the beginning of the final stage of the disease. The leaves turn brown and shrivel and the plants may remain standing in the row. The wilted and dead leaves

are the only external symptoms of the disease. There is practically no yellowing of any of the foliage. If the stems are cut crosswise or split lengthwise dark streaks may be seen in the woody portion. These discolored streaks are the diseased vascular bundles. The discoloration is most pronounced near the soil line and extends up the main stem to the leaf petioles and toward the tips of the branches. The disease is most commonly observed affecting tomato plants in Florida about the time of the first bloom. Infections occasionally are not severe enough to kill plants but may cause a definite stunt or wilt of one side of plants while other branches show no marked symptoms. The fruits of infected plants show no characteristics of the disease except that they wilt and shrivel and decline with the diseased plant.

Brown rot of potato in Florida occurs on plants growing in infested soil. The bacteria multiply in the vascular tissues of affected potato plants and cause a wilt similar to that produced in tomato, eggplant, and pepper plants. The tubers produced on diseased plants become infected and harbor the bacteria in the vascular tissue during transit and storage. At digging time severely affected tubers can be detected by the brown discoloration of the skin at the stolon end and eyes and by the presence of masses of the sticky bacteria which ooze from these places where they mix with dirt, and on drying are glued to the skin. It is difficult to detect the disease in slightly infected tubers even after they are sliced and examined internally; but in moderately infected ones the disease can be recognized by the brown discoloration of the vascular ring from which the bacteria ooze and collect in drops a few minutes after the tubers are sliced.

The disease of tobacco caused by the same organism is called Granville wilt. It is indicated first by the drooping of one or more of the lower leaves. The wilted leaves may recover for the first few nights but soon become permanently wilted. Plants that become infected early may be killed or show the disease during the remainder of the season. Plants may become diseased at any time until the end of the season. The leaves become pale green and finally yellow, eventually dying and turning brown. Sometimes leaves on one side of a plant wilt first. Upon cutting the stem of a wilted plant at an angle the vascular tissue will appear brownish-gray. Close examination of the cut end following pressure frequently reveals drops of dirty-white ooze which are accumu-

lations of the bacteria and are a definite diagnostic characteristic of the disease. The root system becomes brown and dies.

## CONTROL

In the past, brown rot has been avoided by growing non-susceptible crops on infested soils. Seedbeds should be located in non-infested soil, and no solanaceous seedlings grown in infested soil should be used as transplanting stock.

Potato tubers showing any external signs of the disease should be picked out at the packing plant; if packed with sound potatoes they will decay while in transit to market and lower the value of the whole shipment.

No resistant varieties of tomatoes, eggplant, peppers, or other solanaceous crops, with the exception of potatoes, have been found. The Katahdin and Green Mountain varieties of potatoes are resistant to brown rot, and, if infested soil is planted, they should be grown instead of susceptible varieties such as the Spaulding Rose. In the Hastings section the Katahdin is now grown on practically all infested potato land.

The disease can be almost entirely eliminated from infested land by a specific sulfur-limestone soil treatment which is described in detail in Florida Experiment Station Bulletin 299. Briefly, this treatment consists of an application of the proper amount of sulfur to infested soil in May, June, or July to adjust the reaction to pH 4.0 which kills the brown rot bacteria. In the fall, several weeks prior to planting a crop, the sulfured land is then treated with sufficient limestone to readjust it to a reaction favorable for plant growth. At Hastings normal potato yields have been produced and almost perfect control of brown rot secured for the last five years in sandy soils which were treated with sulfur and limestone in 1935.